Please check applicable box (es):
- ☐ GOA Groundfish FMP
- ☒ BSAI Groundfish FMP
- ☐ Scallop FMP
- ☒ BSAI Crab FMP
- ☐ Salmon FMP

# HABITAT AREAS OF PARTICULAR CONCERN (HAPC) PROPOSALS

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## Title and Brief Statement of Proposal:

**Aleutian Islands Special Management Area: Pinnacles and Seamounts**

The Aleutian Islands ecosystem is one of the most vibrant, dynamic, productive and rare ocean environments in the world. With over 450 species of fish, more than 50 species of seabirds that migrate from all seven continents around the world, and 25 species of marine mammals, this rich and unique sea world is an international treasure. It is a rare and wondrous place on the planet deserving of special protections. In this rare and unique ecosystem, there are 82 documented pinnacles and 3 documented seamounts. Pinnacles and seamounts are rare and exceptional formations that are essential fish habitat rich with the formation of living seafloor such as corals and sponges. According to NMFS Researchers, the Aleutians harbor the greatest diversity and abundance of cold water corals in Alaska and perhaps the world (Stone 2003). As such, the Aleutian Islands should be managed as a special management area, and specific fishery mitigation measures are necessary to protect the rare and fragile benthic habitat on the Aleutian Islands seafloor. In an ecosystem as biodiverse, productive, and rare as the Aleutians Islands marine environment, destructive bottom trawling should be permitted as the exception, not the rule, and only in areas where it is scientifically proven to not harm the ancient living seafloor.

## Objectives of Proposal:
*(Identification of the habitat and FMP species the HAPC proposal is intended to protect.)*

This proposal will protect the living seafloor of the **pinnacles and seamounts** HAPCs of the **Aleutian Islands** from impacts from bottom trawls, pelagic trawls that contact the bottom, and other commercial fishing gear that touches the bottom.

There are 82 documented pinnacles and 3 documented seamounts in the Aleutian Islands region. Pinnacles and seamounts rise up from ocean floor providing habitat for a wide variety of species in a concentrated area. One of the known coral gardens in the Aleutian Islands occurs on a pinnacle.

Corals, sponges, and other living seafloor are habitat that provides nurseries, places to feed, shelter from currents and predators, and spawning areas for many species of marine life including rockfish, Pacific Ocean perch, flatfish, Atka mackerel, golden king crab, shrimp, Pacific cod, pollock, greenling, greenland turbot, and sablefish. Perhaps the oldest animals on the planet, these long-lived corals have evolved in one of the most stable habitats on earth, too deep to be affected by tides and waves or sunlight. Consequently, they are extremely vulnerable to disturbance and are easily destroyed by a variety of fishing gears.

Oceana's Aleutian Islands Pinnacles and Seamounts HAPC proposal is completely contained within the designated essential fish habitat areas of the following FMP managed species: Shortraker rockfish, rougheye rockfish, northern rockfish, sharpchin rockfish, dusky rockfish, Atka mackerel, Pacific cod, Pacific ocean perch, and Golden king crab.

## Statement of purpose and need:

The seafloor of the Aleutian Islands is unique. It is also an economic gold mine as part of Alaska fisheries that provide more than half of the nation's seafood. However, indiscriminate destructive bottom trawling in delicate living seafloor habitat like corals, sponges, and other living substrates is irreversibly marring this unique, pristine environment. In 1999, a single pass of a bottom trawl removed 21 metric tons of coral and bryozoans from a pinnacle 27 nm offshore of Agattu Island. With such dire impacts of destructive bottom trawling, it is imperative to protect the HAPC invertebrates on other pinnacles from this kind of decimation.

From 1990 to 2002, U.S. federal fishery observers reported over 1,500 metric tons of coral and sponge bycatch from the Aleutian Islands, of which approximately 90% was caused by bottom trawling (NMFS 2002). Corals and sponges have already been identified as HAPC by NOAA fisheries in Amendment 55 to the Groundfish FMPs (1998). As such, it is prudent and necessary to mitigate the impacts of this destructive bottom trawling on these known HAPCs.

Such mitigation is not unprecedented. In 2000, NOAA Fisheries established the Sitka Pinnacles Marine Reserve in Southeast Alaska. Protection of deep sea corals and sponges was cited as a rationale for the Sitka Pinnacles Marine Reserve and the no-trawl zone in Southeast Alaska (Witherell and Coon 2000). Further, the rationale for closing the Sitka pinnacles to groundfish fishing acknowledged "the pinnacles habitat is fragile, and the concentration of fishes in a relatively small, compact space can lend itself to overfishing of certain species, particularly lingcod, at sensitive life stages" (Federal Register, Vol. 65, No. 218). The Sitka reserve boasts fantastic aggregations of marine life including lingcod, rockfish, corals and sponges, among others.

Additionally, world fisheries have a documented geographic and depth expansion (Pauly et al., 2003). It is important to protect unexploited areas from future expansion to deeper, previously unfishable areas until there is better understanding of deepwater communities (Koslow et al., 2000).

## A description of how the proposed HAPC addresses the four considerations set out in the final EFH regulations:

NOAA Fisheries has identified corals and sponges in Alaska as HAPC as indicated in Amendment 55 to the Groundfish FMPs (1998). Additionally, in a letter from Dr. William Hogarth to Mr. Jim Ayers dated September 9, 2002, Dr. Hogarth stated, "Corals, sponges, and other living substrate in waters off Alaska are already classified by NOAA Fisheries as Habitat Areas of Particular Concern deserving of special protection because of their importance as habitat and their vulnerability to human impacts."

1. **Ecological importance: does the habitat perform an important ecological function?**

Pinnacles and seamounts provide an obstacle to water flow that creates upwelling of currents and consequently nutrients. This nutrient rich water flow promotes complex and dense ecosystems on these undersea structures which include corals and sponges. Deep water corals and sponges provide high quality fish habitat. The vertical structure formed by these coral colonies provides relief on the seafloor, increases habitat complexity, increases niche breadth, and increases biodiversity. Sessile epifauna increase habitat complexity and play an important factor in structuring benthic communities (Bradshaw et al. 2003). Pinnacles and seamounts support a rich diversity of species in a small area and are worthy of special protection.

2. **Sensitivity: the extent to which the habitat is sensitive to human induced environmental degradation**

Areas characterized by low natural disturbance and long lived species are the most sensitive to anthropogenic disturbance (NRC, 2002). The seafloor of the Aleutians, including pinnacles and seamounts, epitomizes the type of habitat that is most sensitive to disturbance and takes the longest to recover, if ever. Deep-water corals are the oldest and slowest growing types of epifauna. Gorgonian coral colonies are long-lived and slow-growing. A colony of *Primnoa resedaeformis* was aged to 112 years in the Gulf of Alaska (Andrews et al. 2002). Larger colonies formed from multiple settlement events may be 500 years old or more (Risk et al, 2000). Between 1990 and 2002, 175 metric tons of coral and bryozoans were removed by commercial bottom trawls at a depth of approximately -500 m (NORPAC data, unpublished). The depth distribution of corals species Paragorgia and Primnoa in the Aleutians falls within depths currently exploited by the trawl fleet.

3. **Exposure: whether, and to what extent, development activities are, or will be stressing the habitat**

From 1990 to 2002, U.S. federal fishery observers reported over 1,500 metric tons of coral and sponge bycatch from the Aleutian Islands, of which approximately 90% was caused by bottom trawling (NMFS 2002). In 1999, a single pass of a bottom trawl removed 21 metric tons of coral and bryozoans from a pinnacle 27 nm offshore of Agattu

Island. With such dire impacts of destructive bottom trawling, it is imperative to protect the HAPC invertebrates on other pinnacles from this kind of decimation.

Bottom trawling alters the physical structure of the seafloor, reduces habitat complexity, and changes the composition of benthic communities. Bottom trawling removes epifauna, thereby reducing habitat complexity and species diversity of the benthic community (Collie et al. 2000, Kaiser et al. 2000). According to the National Academy of Sciences, if disturbance from trawling exceeds the resiliency threshold, then irrevocable long-term ecological effects will occur. Gravel pavement substrate disturbed by bottom trawling on Georges Bank in the Northeast Atlantic, for example, had significantly less emergent epifauna, shrimp, polychaetes, brittlestars, and small fish than undisturbed sites (Collie et al., 2000). Scavenging organisms tended to dominate communities in areas of high dredging disturbance while long-lived organisms and fragile taxa disappeared (Collie et al. 1997).

Bottom trawling decreases benthic productivity. Trawled areas of the North Sea, off the coast of Ireland, were significantly less productive when compared to untrawled areas of similar habitat type (Jennings et al. 2001). Areas disturbed by mobile fishing gear on Georges Bank had lower levels of benthic production (both biomass and energy) when compared to undisturbed areas (Hermsen et al. 2003).

Research conducted in Alaska confirms research in other regions indicating that bottom trawling gear damages sensitive benthos. When bottom trawling occurs in coral habitat, up to 30% of coral colonies can be removed (Krieger, 1999). During a submersible study in the Gulf of Alaska, it was reported that 50% of the coral had been removed or broken by a single pass of a research bottom trawl (Krieger, 2002). The corals at the site had not recovered seven years later (Krieger, 2002).

In Seguam Pass in the Aleutian Islands, gorgonian corals, which 20 years ago were a major component of the bycatch of the Atka mackerel fishery, steadily declined thereafter (NMFS 2001). This suggests that after years of bottom fishing, there were significantly fewer of these habitat-forming species left to catch. Video observation of some areas in Seguam Pass show completely destroyed coral habitats with only fragments of coral skeletons and rubble on the bottom (Zenger, 1999).

4. **Rarity: the rarity of the habitat type**

Aleutian Islands benthic habitat is unique and has been recorded nowhere else in Alaska or in the world. Hard corals in the genera *Paragorgia, Fanellia, Callogorgia*, *Primnoa*, *Calcigorgia*, *Thouarella*, and *Arthrogorgia* are present in dense aggregations. Such bioherms, described as deep-sea coral gardens, are unique to the Aleutian Islands. There are 82 pinnacles and 3 seamounts in the Aleutians.

## Proposed management measures and their specific objectives, if appropriate:

Given its unique status on the planet, we propose the entire Aleutian Islands region be designated as a **Special Management Area** with categories of HAPC and respective management approaches. In order to protect exquisite and rare benthic habitat the following measures should be taken:

For pinnacles, there should be no bottom trawling and other commercial bottom contact should be limited. This management measure would apply to all pinnacles except the three pinnacles noted in Table 1, excluded from HAPC protection because they fall within the core bottom trawl fishing area.

For seamounts, there should be a moratorium on commercial fishing.

## Proposed solutions to achieve these objectives: (*how might the problem be solved?*) Include concepts of methods of measuring progress towards those objectives.

The pinnacles and seamounts of the Aleutians deserve special protection. Management measures should prohibit bottom trawling within a two mile radius around the charted least depth of known pinnacles. Any other commercial bottom contact should be limited and permitted only upon determination by NOAA Fisheries that the fishery can be conducted without habitat destruction.

For seamounts, as a precautionary measure, there should be a moratorium on commercial fishing in these areas until they can be explored, the benthic habitat mapped, populations of seamount species estimated, and until NOAA Fisheries determines that a fishery can be conducted without habitat destruction.

Consistent with the Council and agency's discussion, this HAPC proposal assumes that currently closed or restricted areas would remain closed or restricted. For example, current management measures to protect Steller sea lions and their habitat would remain in place.

## Expected benefits to the FMP species of the proposed HAPC, and supporting information/data:

Oceana's Aleutian Islands Pinnacles and Seamounts HAPC proposal is completely contained within the designated essential fish habitat areas of the following FMP managed species: Shortraker rockfish, rougheye rockfish, northern rockfish, Atka mackerel, Pacific cod Pacific ocean perch, and Golden king crab.

The areas described in this proposal are ecologically important for many reasons, including as habitat for commercially exploited groundfish species. Pinnacles and seamounts are home to many species of corals, sponges, and other important living seafloor substrates. Corals provide essential habitat for a variety of marine species including several species of rockfish, king crab, Atka mackerel, shrimp, Pacific cod, walleye pollock, Greenland turbot, greenlings, and other flatfish (Krieger 1999). Rockfish and Atka mackerel are associated with gorgonian coral, hydrocoral and cup corals (Heifetz 2002). Soft corals in the Bering Sea were found to be in close association with gadids (e.g. Pacific Cod and Walleye Pollock), Greenland turbot, greenlings, and other flatfish (Heifetz 2002). Krieger (1993) noted that juvenile Pacific ocean perch exhibit a preference for rugged areas containing cobble-boulder and epifaunal cover and that shortraker rockfish strongly prefer rugged, high-profile habitat interspersed with boulders. Carlson and Straty (1981), Straty (1987), and Pearcy et al. (1989) found that juvenile rockfish exhibit a preference for high-relief habitat. Juvenile and adult *Sebastes sp.* were often found in association with *Primnoa spp.* during underwater video surveys of rockfish habitat in southeast Alaska (Bizzarro, 2002). Corals may be important for growth to maturity for demersal slope rockfish (EFH EIS).

Research from around the world indicates the destruction of living seafloor negatively impacts fish populations. Destruction of bryozoan growths by trawling in Tasman Bay, New Zealand resulted in a marked reduction in numbers of associated juvenile fish (Turner et al. 1999). Predation rate on juvenile Atlantic cod (*Gadus morhua*) increases with decreasing habitat complexity (Walters & Juanes 1993). Case studies in New Zealand and Australia suggested that loss of habitat structure through removal of large epibenthic organisms by fishing had negative effects on associated fish species (Turner et al. 1999). Removal of epifaunal organisms like corals may lead to the degradation of habitat such that it is no longer suitable for associated fish species (Auster et al. 1996).

Protecting habitat areas from fishing impacts has positive effects. In an area of the Irish Sea, for example, an 11 year closure to scallop dredging increased hydroid colonies (Bradshaw et al. 2003). Hydroid colonies increased diversity and abundance of benthic fauna as well as recruitment of juvenile scallops (Bradshaw et al. 2003). A model of trawl closures around locations where trawl "hangs" occurred showed that prohibiting trawling in areas with structural complexity had positive effects on juvenile Atlantic cod (Link & Demerest, 2003).

## Identification of the fisheries, sectors, stakeholders and communities to be affected by the establishment of the proposed HAPC (Who benefits from the proposal and who would it harm?) and any information you can provide on socioeconomic costs, including catch data from the proposed area over the last five years:

The proposed pinnacle bottom trawl closures and those NOAA may determine appropriate and necessary of other fisheries would encompass approximately 3,216 km$^2$. Economic impacts to the bottom trawl fleet from the proposed management measure are minimal as the pinnacle closures fall outside of most of the core fishing area. Further it is likely that NOAA Fisheries will find that other bottom contact fisheries do have habitat damaging impact. Appropriate prohibitions of bottom contact by these other fisheries may result in permissible shifts in location or change of technique but minimal loss of revenue.

Atka seamount, Adak seamount, and Bowers seamount are far offshore and deep. As such, they currently experience very low or no fishing pressure from the fishing industry. The proposed seamount commercial fishing closures would have no economic impact since the seamounts are far offshore and are currently not fished. Further economic assessments may be conducted in the HAPC National Environmental Policy Act process.

Clear geographic delineation for proposed HAPC (example written latitude and longitude reference points and/or delineation on an appropriately scaled NOAA chart):

There are 3 documented seamounts and 82 documented pinnacles in the Aleutian Islands region. This proposal includes all three of the documented seamounts and 79 of the documented pinnacles. Three pinnacles, as noted in Table 1, were excluded from HAPC protection because they fall within the core fishing area.

Data

**Table 1: Pinnacles in the Aleutians**

| Latitude N | Longitude W | Charted Least Depth (Fathoms) | Reference to Nearest Shore | Distance from Reference (nm) | |
|---|---|---|---|---|---|
| 53° 51.5′ | 165° 57.0′ | 9 | Sedanka I. | 5 | |
| 53° 15.5′ | 168° 51.0′ | 65 | Umnak I. | 6 | |
| 53° 41.0′ | 167° 11.0′ | 13 | Unalaska I. | 4 | |
| 53° 32.5′ | 167° 20.0′ | 15 | Unalaska I. | 4 | |
| 53° 26.0′ | 167° 44.0′ | 9 | Unalaska I. | 3 | |
| 52° 46.0′ | 168° 52.0′ | 20 | Umnak I. | 7 | |
| 52° 51.0′ | 169° 15.5′ | 14 | Umnak I. | 5 | |
| 52° 57.0′ | 169° 35.5′ | 15 | Kagamil I. | 4 | |
| 52° 41.0′ | 169° 40.0′ | 13 | Chuginadak I. | 5.5 | |
| 52° 29.0′ | 169° 52.0′ | 38 | Herbert I. | 17 | |
| 52° 19.5′ | 171° 48.0′ | 93 | Seguam I. | 23 | |
| 52°25.5′ | 172° 09.0′ | 55 | Seguam I. | 7 | |
| 52° 31.5′ | 172° 10.0′ | 63 | Seguam I. | 11.5 | |
| 52° 40.0′ | 172° 03.0′ | 87 | Seguam I. | 21.5 | |
| 52° 36.5′ | 172° 41.0′ | 98 | Seguam I. | 16 | |
| 51° 58.0′ | 173° 05.0′ | 14 | Amilia I. | 6 | |
| 54° 17.0′ | 165° 18.0′ | 3 | Akun I. | 6 | |
| 54° 19.5′ | 165° 59.5′ | 48 | Akun I. | 6 | |
| 53° 39.0′ | 168° 23.0′ | 286 | Umnak I. | 9 | |
| 53° 13.0′ | 169° 46.0′ | 53 | Uliaga I. | 8 | |
| 52° 57.0′ | 169° 29.0′ | 89 | Kagamil I. | 8 | |
| 52° 49.0′ | 170° 13.0′ | 38 | Herbert I. | 3 | |
| 52° 49.0′ | 170° 29.0′ | 106 | Yunaska I. | 8 | |
| 52° 17.0′ | 170° 42.0′ | 72 | Yunaska I. | 16 | |
| 52° 06.0′ | 171° 51.0′ | 67 | Seguam I. | 21 | Core fishing, not included |
| 52° 35.0′ | 172° 20.0′ | 85 | Seguam I. | 12 | |
| 52° 35.0′ | 173° 15.0′ | 109 | Amlia I. | 28 | |
| 52° 32.0′ | 173° 26.0′ | 93 | Atka I. | 24 | |
| 52° 28.0′ | 173° 36.0′ | 99 | Atka I. | 17 | |
| 51° 56.0′ | 174° 14.0′ | 47 | Atka I. | 8.5 | |
| 51° 56.0′ | 174° 22.0′ | 45 | Atka I. | 7.5 | |
| 52° 16.0′ | 175° 07.0′ | 129 | Koniuji I. | 3 | |
| 51° 34.0′ | 178° 13.0′ | 96 | Ilak I. | 6 | |
| 51° 24.0′ | 178° 33.0′ | 41 | Ilak I. | 10 | |
| 51° 08.0′ | 179° 00.0′ | 55 | Amatignak I. | 7 | |
| 51° 23.0′ | 179° 31.0′ | 49 | Amatignak I. | 15 | |
| 51° 29.0′ | 179° 52.0′ | 58 | Amchitka I | 25 | |
| 52° 28.0′ | 179° 45.0′ | 38 | Semisopochnoi I. | 35 | |
| 53° 51.0′ | 179° 56.0′ | 24 | SE Bowers Bank | 23 | |
| 54° 10.0′ | 179° 55.0′ | 33 | SE Bowers Bank | 6 | |

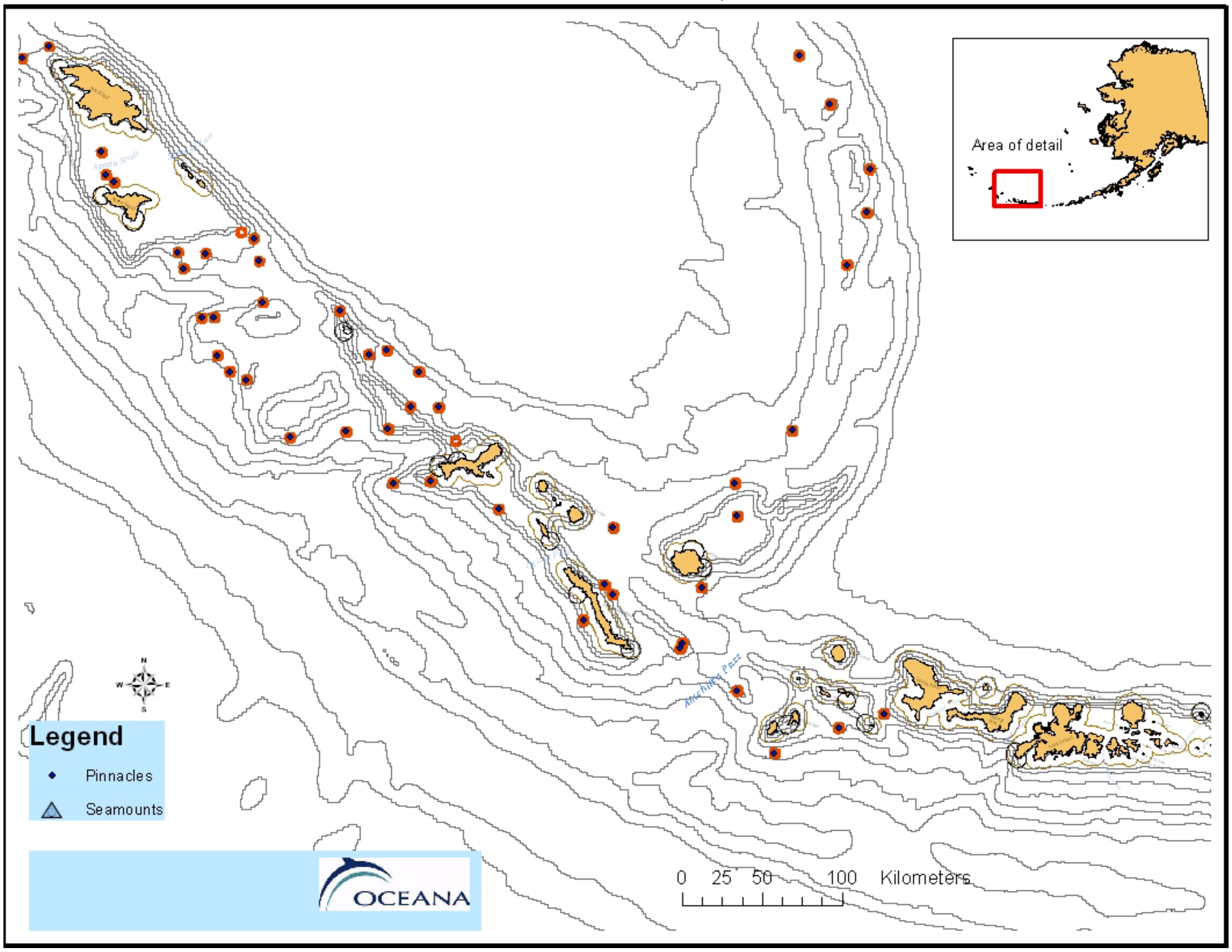
| | | | | | |
|---|---|---|---|---|---|
| 54° 24.0′ | 179° 47.0′ | 6 | Bowers Bank | | |
| 54° 39.0′ | 179° 11.0′ | 99 | NW Bowers Bank | 17 | |
| 54° 50.0′ | 178° 43.0′ | 120 | NW Bowers Bank | 37 | |
| 51° 31.0′ | 179° 52.0′ | 78 | Amchitka I. | 16 | |
| 51° 51.0′ | 179° 50.0′ | 69 | Semisopochnoi I. | 5 | |
| 52° 52.0′ | 179° 57.0′ | 28 | Semisopochnoi I. | 17 | |
| 52° 18.0′ | 179° 53.0′ | 21 | Semisopochnoi I. | 15 | |
| 51° 25.0′ | 178° 58.0′ | 5 | Amchitka I. | 5 | |
| 51° 37.0′ | 179° 07.0′ | 81 | Amchitka I. | 6 | |
| 51° 39.0′ | 179° 01.0′ | 65 | Amchitka I. | 4 | |
| 51° 58.0′ | 178° 53.0′ | 106 | Little Sitkia I. | 11 | |
| 51° 48.0′ | 177° 52.0′ | 36 | Kiska I. | 13 | |
| 51° 47.0′ | 177° 12.0′ | 49 | Kiska I. | 5 | |
| 52° 03.0′ | 177° 15.0′ | 17 | Kiska I. | 6 | Core fishing, not included |
| 51° 41.0′ | 176° 54.0′ | 62 | Kiska I. | 16 | |
| 52° 11.0′ | 176° 59.0′ | 58 | Kiska I. | 19 | |
| 52° 07.0′ | 176° 45.0′ | 2 | Kiska I. | 21 | |
| 52° 19.0′ | 176° 41.0′ | 182 | Buldir I. | 26 | |
| 51° 57.0′ | 176° 39.0′ | 14 | Kiska I. | 20 | |
| 51° 50.0′ | 176° 19.0′ | 90 | Kiska I. | 33 | |
| 52° 17.0′ | 176° 12.0′ | 29 | Buldir I. | 10 | |
| 52° 21.0′ | 176° 20.0′ | 76 | Buldir I. | 13 | |
| 51° 40.0′ | 175° 53.0′ | 67 | Buldir I. | 39 | |
| 52° 26.0′ | 175° 47.0′ | 36 | Buldir I. | 5 | |
| 51° 51.0′ | 175° 18.0′ | 60 | Buldir I. | 37 | |
| 51° 51.0′ | 175° 08.0′ | 86 | Buldir I. | 39 | |
| 51° 54.0′ | 174° 58.0′ | 79 | Buldir I. | 43 | |
| 52° 17.0′ | 175° 07.0′ | 83 | Buldir I. | 28 | |
| 52° 03.0′ | 174° 41.0′ | 84 | Agattu I. | 40 | |
| 52° 05.0′ | 174° 47.0′ | 52 | Agattu I. | 42 | |
| 52° 29.0′ | 174° 55.0′ | 87 | Buldir I. | 36 | |
| 52° 35.0′ | 174° 47.0′ | 61 | Agattu I. | 36 | |
| 52° 35.0′ | 174° 39.0′ | 12 | Agattu I. | 33 | Core fishing, not included |
| 52° 23.0′ | 174° 27.0′ | 88 | Agattu I. | 26 | |
| 52° 15.0′ | 174° 20.0′ | 64 | Agattu I. | 23 | |
| 52° 19.0′ | 174° 13.0′ | 62 | Agattu I. | 18 | |
| 52° 30.0′ | 173° 24.0′ | 47 | Agattu I. | 4 | |
| 52° 31.0′ | 173° 18.0′ | 34 | Agattu I. | 6 | |
| 52° 37.0′ | 173° 10.0′ | 10 | Attu I. | 10 | |
| 53° 00.0′ | 172° 16.0′ | 138 | Attu I. | 9 | |
| 52° 52.0′ | 172° 06.0′ | 81 | Attu I. | 14 | |
| 53° 04.0′ | 170° 57.0′ | 18 | Attu I. | 56 | |
| 52° 57.0′ | 170° 52.0′ | 34 | Attu I. | 59 | |

**Table 2: Seamounts in the Aleutians**

| NAME | DEPTH (m) | LAT (dec. degrees) | LONG (dec. degrees) |
|---|---|---|---|
| ADAMS | -3045 | 50.020 | -176.230 |
| ATKA | -4517 | 50.270 | -175.170 |
| BOWERS | -2250 | 54.080 | -174.780 |

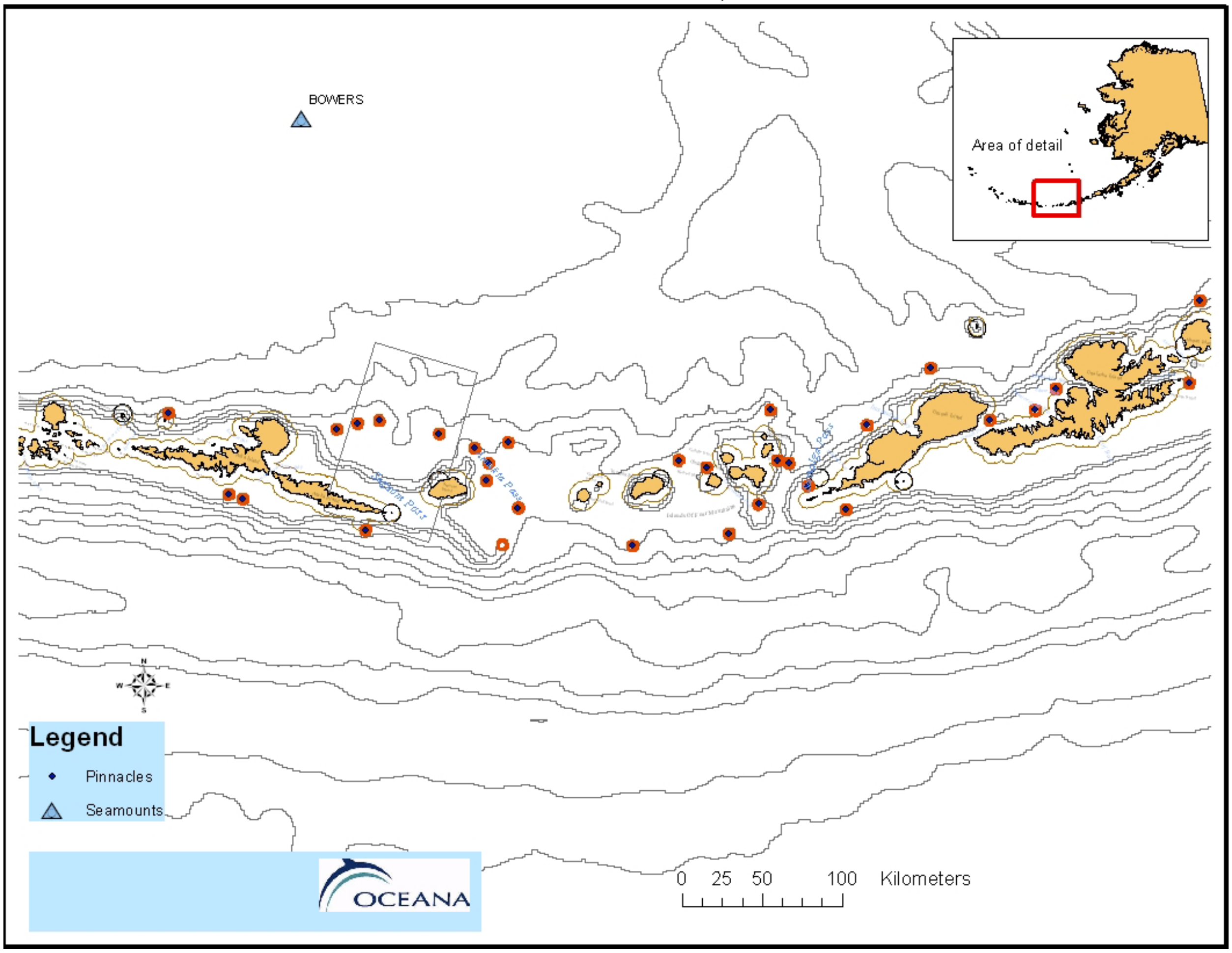
<u>Maps</u>

**Pinnacles in the Aleutians, Part 1**



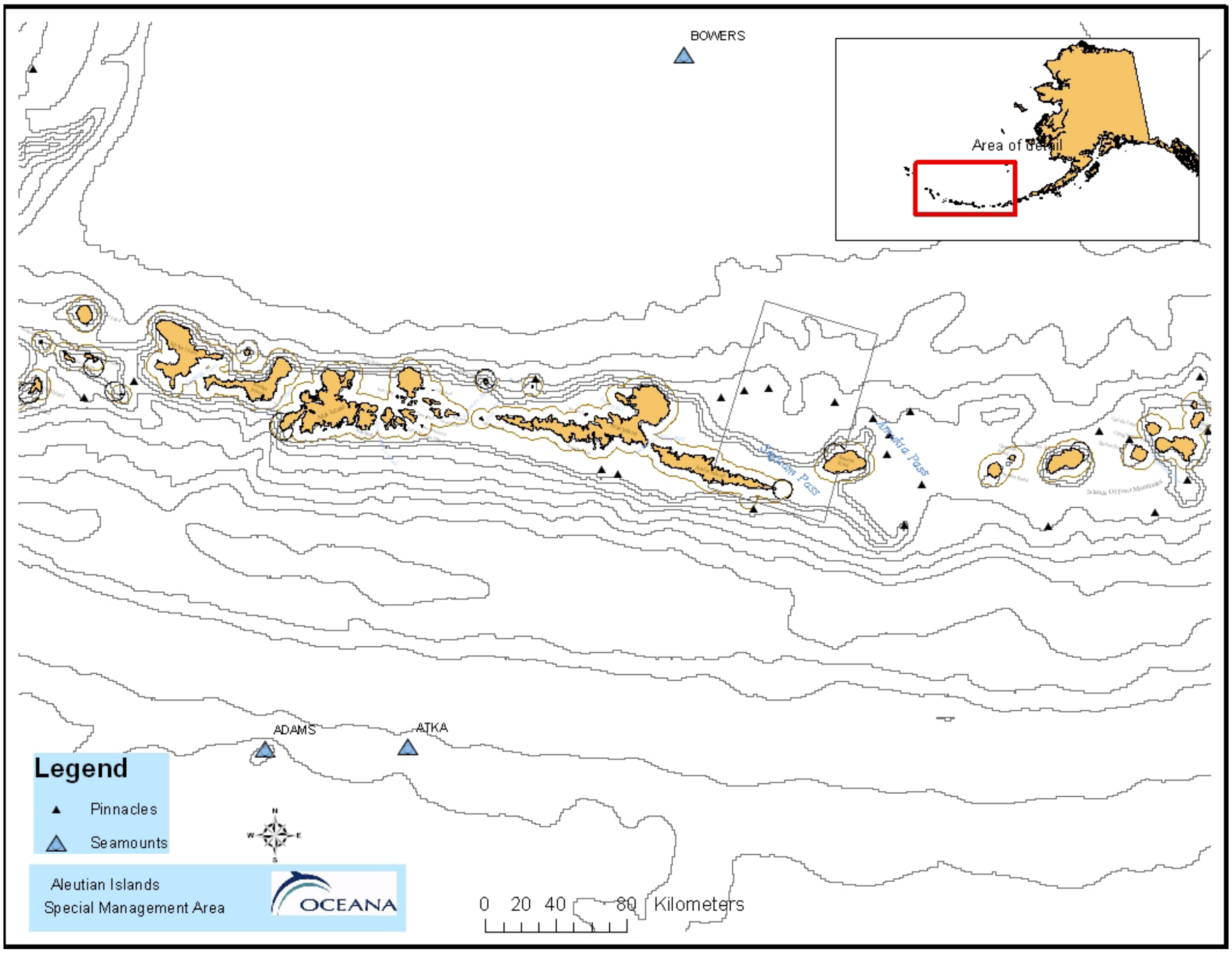

Map 1: Aleutian Islands, Attu Island to Great Sitkin Island: Pinnacles

**Pinnacles in the Aleutians, Part 2**




Map 2: Aleutian Islands, Atka Island to Unalaska: Pinnacles

**Seamounts in the Aleutians**




Map 3: Bowers, Adams, and Atka seamounts in the Aleutians.

Provide best available information and sources of such information to support the objectives for the proposed HAPC. (Citations for common information or copies of uncommon information):

**Data Acquisition and Assumptions:**
The following section describes the information and process Oceana used to develop proposed HAPC designations and associated management measures.

The precision and accuracy of our analyses is necessarily limited by the precision and accuracy of the underlying information. Our requests to the Fisheries Service for observer data were provided in aggregated 10x10 km blocks. The blocks, or "grids" are referenced by a master gridcode. Blocks displayed in figures in this proposal can be referenced to latitude/longitude coordinates on navigational charts. We used these data to analyze fishing effort and the approximate economic value of fishing areas. Data at this resolution covered approximately 90% of groundfish fishery effort (Ren Narita, AFSC pers. comm.). A necessary assumption for the analysis was that fishing effort was uniform across a given block. For example, a closed area within a block would have an economic impact proportional to the percentage of the block that was closed. As such, an area of 25 $km^2$ closed to a certain gear type within a 100 $km^2$ fishing block where \$1 million ex-vessel fish value was caught would result in an economic impact of \$250,000 of lost revenue. Another assumption is that unobserved vessels fished in the same blocks as observed vessels.

In addition to using observer data, we also incorporated information from the NOAA RACEBASE trawl survey database. Trawl survey end points were plotted as point locations and the catch per unit effort for coral species or species groups was noted. Catch per unit effort in kilograms per square kilometer was calculated by dividing sample weight by area swept. Area swept was calculated as the net width multiplied by trawl distance.

The location of areas described from submersible dives as coral gardens (Stone, 2003) was obtained from NOAA scientists. A database of pinnacle locations was obtained from NOAA's Alaska Regional Office. Locations of seamounts were obtained from MCBI's oceanographic data CD-rom (MCBI, 2003).

**Methods:**
To identify core bottom trawl fishing areas, we analyzed twelve years of fishery observer data of the bottom trawl fleet to identify the most important and heavily trawled areas. Fishing blocks within Seguam Pass, where fishing activity has significantly changed due to Steller sea lion mitigation measures, were excluded from the analysis. Of the remaining blocks, from 1990 to 2002, 276 blocks (27,600 $km^2$) in the Aleutians had observed bottom trawl activity. We found that from 1990 to 2002, 55 fishing blocks (5,500 $km^2$) accounted for 82% of the observed total catch, 74% of the observed total hauls, and 81% of the observed total ex-vessel value.

Data collected by fishery observers do not give a complete picture of bottom trawl effort in the Aleutian Islands. However, the areas encompassed in the map cover a large percentage of bottom trawl catch in the Aleutians. For example, the 2002 observer data covers 100% of the Atka mackerel catch, 70% of the rockfish catch, and 60% of the Pacific cod catch when compared to total recorded catches in the 2003 SAFE report.

Pinnacles, and seamounts were plotted on the map as point locations and compared to patterns of trawl effort. Eighty two pinnacles and three seamounts were identified in the Aleutian Islands region. Three pinnacles in the core fishing area were excluded to provide for fishing opportunities.

Consistent with the Council and agency's discussion, our HAPC proposals assume that currently closed or restricted areas would remain closed or restricted. For example, current management measures to protect Steller sea lions and their habitat would remain in place.

**Relevant Literature:**
Andrews, A. H., E. E. Cordes, M. M. Mahoney, K. Munk, K. H. Coale, G. M. Cailliet, & J. Heifetz. 2002. Age, growth, and radiometric age validation of a deep-sea, habitat-forming gorgonian (*Primnoa resedaeformis*) from the Gulf of Alaska. Hydrobiologia, vol 471, pp 101-110.

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